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CHANGES IN THE SPATIAL POPULATION STRUCTURE OF JAPAN

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Preface

This paper was commissioned by the IIASA research task on Human Settlement Systems: Development Processes and Strategies, and was presented at a IIASA Conference on Human Settlement System Dynamics held in December, 1976. It sets forth the delineation criteria for J-SMSAs, the Japanese equivalent of the U.S. Standard Metropolitan Statistical Areas and it also analyzes the recent evolution of the Japanese human settlement system in this context. The work presented here will be extended at IIASA by Professor Kawashima to include a delineation of Japanese functional urban regions (comparable to those being delineated for countries in Western and Eastern Europe) and economic and demographic analyses using these regions. The results of these efforts will appear in future research memoranda in this series.

The research reported here was partially carried out with funds provided by the Ford Foundation and the Japanese Ministry of Education. The author is particularly grateful for the cooperation received from Professors Norman Glickman and Robert C. Douglas of the University of Pennsylvania. Thanks are also due to Takashi Nakai for his diligent research assistance.

Papers in the IIASA Series on Human Settlement Systems: Development Processes and Strategies

1. Peter Hall, Niles Hansen and Harry Swain, *Urban Systems: A Comparative Analysis of Structure, Change and Public Policy*, RM-75-35, July 1975.

2. Niles Hansen, *A Critique of Economic Regionalizations of the United States*, RR-75-32, September 1975.

3. Niles Hansen, *International Cooperation and Regional Policies Within Nations*, RM-75-48, September 1975.

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16. Koren Sherrill, *Functional Urban Regions and Central Place Regions in the Federal Republic of Germany and Switzerland*, RM-77-17, April 1977.

Abstract

This study uses data from the 1960-1975 period to analyze the recent evolution of the Japanese human settlement system. It examines comprehensively the demographic, local government budget and industrial employment aspects of urban and rural spatial dynamics. The spatial unit of analysis used is the J-SMSA, the Japanese version of the U.S. Standard Metropolitan Statistical Area. The results indicate that before 1970 there were large shifts in population and economic activity from the nonmetropolitan areas to metropolitan areas, and from the southwest to the middle central region. Recently, however, the rate of population loss has decreased significantly in nonmetropolitan areas while the southwest has experienced slight population increases.

CHANGES IN THE SPATIAL POPULATION STRUCTURE OF JAPAN

I. Introduction

Before 1970 there were large shifts in population and economic activity from the non-metropolitan areas of Japan to the metropolitan areas, and from the southwestern regions to the middle central region. In the past five years, however, the rate of loss of population has significantly decreased in the non-metropolitan areas while the southwestern regions have experienced slight increases in population.

The present paper, which is based on data from the 1960-1975 period summarizes the process which has led to the recent changes in the Japanese human settlement system. The analysis attempts to investigate comprehensively the spatial, demographic, local-government budget and industrial employment aspects of urban and rural dynamics. It is an extension of previous studies of the development of urban systems in Japan by the author (1974, 1975) as well as joint studies with N. Glickman (1975) of the University of Pennsylvania.

In this research, we primarily employ the concept of the Japanese version (J-SMSAs) of the U.S. Standard Metropolitan Statistical Areas, which are economically and socially integrated metropolitan units. The criteria for delineating J-SMSAs are discussed in Section II. Section III deals with the nature of the data used in our analysis of J-SMSAs. In section IV we briefly discuss the diversification index which is used in Section V's empirical analysis of changes in the spatial population structure of Japan. Section VI contains some concluding remarks.

II. The Japanese Version of Standard Metropolitan Statistical Areas

In order to carry out a meaningful analysis of the development of urban sub-systems, the entire area in and around a city (i.e., the area in which activities form an organically integrated economic and social system) needs to be considered as a unit of study. Glickman and I have attempted to delineate the boundaries of the J-SMSAs[1] according to the following criteria (see Glickman, 1975, pp.2-4 for a more detailed discussion):

1. Criteria for core-cities:
   a) Prefectural capitals must be core-cities whether or not they meet the following conditions. Other potential core-cities should satisfy the following three conditions.
   b) The minimum population size must have been equal to or greater than 100,000 in 1970.
   c) The daytime-nighttime ratio of population must have been greater than 1.0.
   d) Seventy-five percent of the ordinary households must be either "agricultural workers' households" or "agricultural and non-agricultural workers' mixed households".
   e) If the distance between the potential core-cities is no more than 20 kilometers, then the cities compose twin, triple, quadruple, ..., core-cities.
2. Criteria for localities to be combined with the core-cities:
   a) The number of commuters from the localities to the core-city must be greater than 500.
   b) The ratio of commuters (from each locality to the core-city) to total employment in each locality must be greater than five percent.
   c) A locality is combined with a core-city to which most commuters go if the locality is eligible to

[1] We sometimes refer to the J-SMSA as the Regional Economic Cluster (REC).

be combined with more than one potential core-city.

d) Seventy-five percent of the ordinary households must be either "non-agricultural workers' households" or "agricultural and non-agricultural workers' mixed households".

In accordance with these conditions, and using 1970 Population Census data, the first phase of delineating the J-SMSAs was carried out. After making some boundary adjustments in the light of relevant functional criteria, the definitive J-SMSA map was drawn (see Map 1). The total population of the J-SMSAs amounts to about 70 percent of the total national population.

Table 1 gives the name list of the J-SMSAs as well as information on code numbers, sequential numbers, numbers of member localities including core-cities, and the region where each J-SMSA is located.[2] The 84 J-SMSAs include a total of 1021 localities (given in Appendix 1, which is available separately).

III. Data for the J-SMSAs

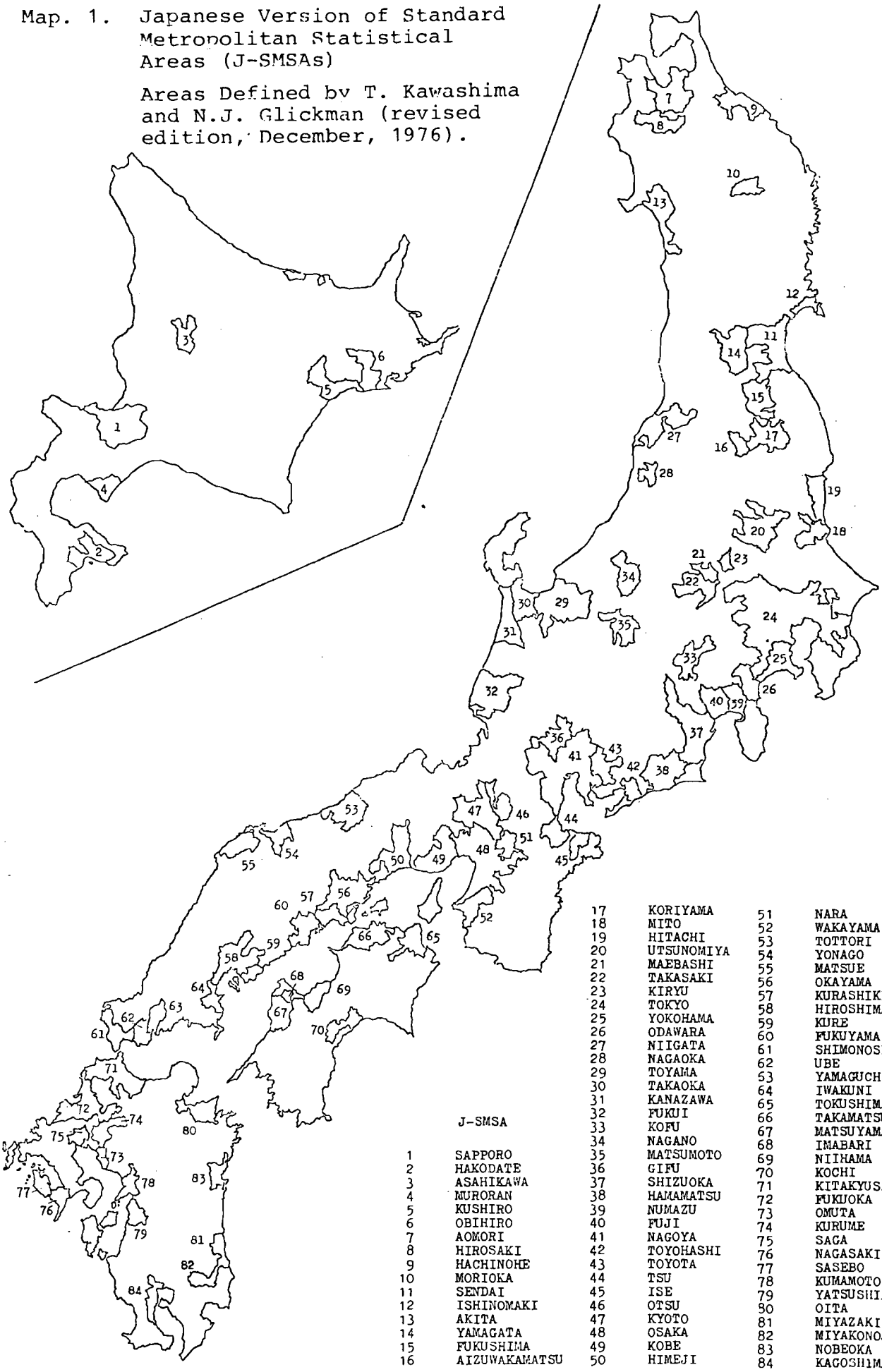
The data bank for the J-SMSAs now includes more than one hundred variables. Data on the locality level were hand tabulated and then aggregated to the J-SMSA level by computer. Data on both levels are now stored on magnetic tape for the use of persons interested in doing empirical research on the Japanese urban system. Tables 2, 3 and 4 show some basic J-SMSA data retrieved from our data bank for purposes of our analyses; data for Japan as a whole also are given. Table 2 gives the population levels in 1960, 1965, 1970 and 1975, the five-year growth rates for each of these time-spans, and the ten-year growth rates for the period from 1960 to 1970 (GR4) and from 1965 to 1975 (GR5). In the last column are shown the values of the ratio

$$(GR5 + 1.0) / (GR4 + 1.0),$$

[2] Okinawa Prefecture is excluded since its reversion took place in 1972.

Map. 1. Japanese Version of Standard Metropolitan Statistical Areas (J-SMSAs)

Areas Defined by T. Kawashima and N.J. Glickman (revised edition, December, 1976).



J-SMSA					
1	SAPPORO	17	KORIYAMA	51	NARA
2	HAKODATE	18	MITO	52	WAKAYAMA
3	ASAHIKAWA	19	HITACHI	53	TOTTORI
4	MURORAN	20	UTSUNOMIYA	54	YONAGO
5	KUSHIRO	21	MAEBASHI	55	MATSUE
6	OBIHIRO	22	TAKASAKI	56	OKAYAMA
7	AOMORI	23	KIRYU	57	KURASHIKI
8	HIROSAKI	24	TOKYO	58	HIROSHIMA
9	HACHINOHE	25	YOKOHAMA	59	KURE
10	MORIOKA	26	ODAWARA	60	FUKUYAMA
11	SENDAI	27	NIIGATA	61	SHIMONOSEKI
12	ISHINOMAKI	28	NAGAOKA	62	UBE
13	AKITA	29	TOYAMA	63	YAMAGUCHI
14	YAMAGATA	30	TAKAOKA	64	IWAKUNI
15	FUKUSHIMA	31	KANAZAWA	65	TOKUSHIMA
16	AIZUWAKAMATSU	32	FUKUI	66	TAKAMATSU
		33	KOFU	67	MATSUYAMA
		34	NAGANO	68	IMABARI
		35	MATSUMOTO	69	NIIHAMA
		36	GIFU	70	KOCHI
		37	SHIZUOKA	71	KITAKYUSHU
		38	HAMAMATSU	72	FUKUOKA
		39	NUMAZU	73	OMUTA
		40	FUJI	74	KURUME
		41	NAGOYA	75	SAGA
		42	TOYOHASHI	76	NAGASAKI
		43	TOYOTA	77	SASEBO
		44	TSU	78	KUMAMOTO
		45	ISE	79	YATSUSHIRO
		46	OTSU	80	OITA
		47	KYOTO	81	MIYAZAKI
		48	OSAKA	82	MIYAKONOJO
		49	KOBE	83	NOBEOKA
		50	HIMEJI	84	KAGOSHIMA

Table 1 J-SMSA Name List

J-SMSA code	Seq. Number	J-SMSA Name	No. of Member Localities	Region
110	1	SAPPORO	5	A
120	2	HAKODATE	5	A
130	3	ASAHIKAWA	1	A
140	4	MURORAN	3	A
150	5	KUSHIRO	3	A
160	6	OBIHIRO	4	A
210	7	AOMORI	3	C
220	8	HIROSAKI	6	C
230	9	HACHINOHE	7	C
310	10	MORIOKA	8	C
410	11	SENDAI	21	C
420	12	ISHINOMAKI	6	C
510	13	AKITA	13	C
610	14	YAMAGATA	7	C
710	15	FUKUSHIMA	8	C
720	16	AIZUWAKAMATSU	6	C
730	17	KORIYAMA	4	C
810	18	MITO	12	C
820	19	HITACHI	6	C
910	20	UTSUNOMIYA	14	C
1010	21	MAEBASHI	6	C
1020	22	TAKASAKI	10	C
1030	23	KIRYU	4	C
1310	24	TOKYO	131	B
1410	25	YOKOHAMA	14	B
1430	26	ODAWARA	8	B
1510	27	NIIGATA	14	C
1520	28	NAGAOKA	4	C
1610	29	TOYAMA	11	C
1620	30	TAKAOKA	8	C
1710	31	KANAZAWA	13	C
1810	32	FUKUI	15	C
1910	33	KOFU	16	C
2010	34	NAGANO	11	C
2020	35	MATSUMOTO	11	C
2110	36	GIFU	23	B
2210	37	SHIZUOKA	8	B
2220	38	HAMAMATSU	17	B
2230	39	NUMAZU	7	B
2240	40	FUJI	4	B
2310	41	NAGOYA	64	B
2320	42	TOYOHASHI	8	B
2330	43	TOYOTA	5	B
2410	44	TSU	11	C
2430	45	ISE	7	C
2510	46	OTSU	8	B
2610	47	KYOTO	15	B
2710	48	OSAKA	69	B
2810	49	KOBE	8	B
2820	50	HIMEJI	18	B

Table 1 (continued)

J-SMSA code	Seq. Number	J-SMSA	No. of Member Localities	Region
2910	51	NARA	5	C
3010	52	WAKAYAMA	11	C
3110	53	TOTTORI	11	C
3120	54	YONAGO	10	C
3210	55	MATSUE	9	C
3310	56	OKAYAMA	15	B
3320	57	KURASHIKI	9	B
3410	58	HIROSHIMA	25	B
3420	59	KURE	10	B
3430	60	FUKUYAMA	9	B
3510	61	SHIMONOSEKI	5	B
3520	62	UBE	4	B
3530	63	YAMAGUCHI	3	B
3540	64	IWAKUNI	5	B
3610	65	TOKUSHIMA	13	D
3710	66	TAKAMATSU	21	D
3810	67	MATSUYAMA	8	D
3820	68	IMABARI	6	D
3830	69	NIIHAMA	3	D
3910	70	KOCHI	9	D
4010	71	KITAKYUSHU	19	E
4020	72	FUKUOKA	25	E
4030	73	OMUTA	6	E
4040	74	KURUME	15	E
4110	75	SAGA	11	E
4210	76	NAGASAKI	8	E
4220	77	SASEBO	3	E
4310	78	KUMAMOTO	16	E
4320	79	YATSUSHIRO	4	E
4410	80	OITA	10	E
4510	81	MIYAZAKI	6	E
4520	82	MIYAKONOJO	3	E
4530	83	NOBEOKA	3	E
4610	84	KAGOSHIMA	11	E
			1021	

Notations for Regions:
A - Hokkaido (6 J-SMSAs)
B - Honshu(I): Tokaido-Sanyo-Megalopolis (25 J-SMSAs)
C - Honshu(II): Non-Tokaido-Sanyo-Megalopolis (33 J-SMSAs)
D - Shikoku (6 J-SMSAs)
E - Kyushu (14 J-SMSAs)

Table 2 Population, 5-year Population Growth Rate, 10-year Population Growth Rate and 10-year Population Growth Rate Ratio for J-SMSAs

J-SMSA Code	Popultn in 1960	Popultn in 1965	Popultn in 1970	Popultn in 1975	GR1	GR2	GR3	GR4	GR5	$\frac{(GR5 + 1.0)}{(GR4 + 1.0)}$
110	887535	1075020	1310693	1558739	,21	,22	,19	,48	,45	.9797
120	322970	323006	343406	362637	,00	,06	,06	,06	,12	1.0566
130	239636	252956	297189	320526	.06	,17	,08	,24	,27	1.0242
140	201221	227200	238137	242939	.13	,05	,02	,18	,07	.9068
150	178731	198984	214922	231558	,11	,08	,08	,20	,16	.9667
160	159846	179329	189643	203004	.12	,06	,07	,19	,13	.9496
210	253952	264921	279294	303054	,04	,05	,09	,10	,14	1.0364
220	232842	229993	231520	237812	-,01	,01	,03	-,01	,03	1.0404
230	253474	264767	281838	297640	,04	,06	,06	,11	,12	1.0090
310	286736	301530	318532	348179	,05	,06	,09	,11	,15	1.0360
410	860509	922598	1019991	1160916	,07	,11	,14	,19	,26	1.0588
420	188427	187376	191066	197906	-.01	,02	,04	,01	,06	1.0495
510	401513	365280	415990	438921	-.09	,14	,06	,04	,20	1.1538
610	383092	382157	391335	409933	,00	,02	,05	,02	,07	1.0490
710	319768	325801	338403	358500	.02	,04	.06	,06	,10	1.0377
720	175162	171115	167605	168709	-,02	-,02	,01	-,04	-,01	1.0312
730	309223	309050	332688	356579	,00	,08	,07	,08	,15	1.0648
810	411235	430158	462343	509540	,05	,07	,10	,12	,18	1.0536
820	318134	331419	335157	348300	,04	,01	,04	.05	.05	1.0000
910	564682	583933	625795	677113	,03	,07	,08	,11	,16	1.0450
1010	279557	281973	318747	341323	,01	,13	,07	.14	,21	1.0614
1020	353262	368553	391387	424741	,04	,06	,09	.11	,15	1.0360
1030	159393	163870	171730	179798	,03	,05	.05	,08	,10	1.0185
1310	13988670	16505308	18897712	20694443	,18	,14	,10	,35	,25	.9257
1410	2232569	2858694	3558172	4210193	,28	,24	.18	,59	.47	.9245
1430	233572	263384	283736	302688	.13	,07	,07	.21	,15	.9504
1510	657650	684250	713690	762819	,04	,04	,07	,09	,11	1.0183
1520	212790	218177	224121	233008	,03	,03	,04	,05	,07	1.0190
1610	477794	480192	493522	522483	,01	,03	,06	,03	,09	1.0583
1620	367534	363314	364085	376281	-,01	,00	,03	-,01	,04	1.0505
1710	482871	507897	540268	600816	,05	,06	,11	,12	,18	1.0536
1810	485114	472662	499568	526488	-.03	,06	,05	,03	,11	1.0777
1910	382963	385021	398003	421889	,01	,03	,06	,04	,10	1.0577
2010	404489	413282	429191	460582	,02	,04	,07	,06	,11	1.0472
2020	288435	293499	306225	326639	,02	,04	,07	,06	,11	1.0472
2110	805117	886222	959945	1043481	,10	,08	,09	,19	,18	.9916

Table 2 (continued)

J-SMSA Code	Popultn in 1960	Popultn in 1965	Popultn in 1970	Popultn in 1975	GR1	GR2	GR3	GR4	GR5	$\frac{(GR5 + 1.00)}{(GR4 + 1.00)}$
2210	793848	845877	927563	993432	.07	.10	.07	.17	.17	1.0000
2220	743710	779062	827403	891775	.05	.06	.08	.11	.14	1.0270
2230	330878	374868	421513	468597	.13	.12	.11	.27	.25	.9843
2240	244499	265534	294619	326038	.09	.11	.11	.20	.23	1.0250
2310	3651968	3774106	4248982	5112486	.03	.13	.20	.16	.35	1.1638
2320	403935	439617	473409	520769	.09	.08	.10	.17	.18	1.0085
2330	311142	364410	445073	525780	.17	.22	.18	.43	.44	1.0070
2410	310101	317047	329540	351408	.02	.04	.07	.06	.11	1.0472
2430	174001	188513	178606	183665	.08	-.05	.03	.03	-.03	.9417
2510	302222	319570	356159	424456	.06	.11	.19	.18	.33	1.1271
2610	1511077	1644808	1809412	1984798	.09	.10	.10	.20	.21	1.0083
2710	6669151	8234298	9521577	10046675	.23	.16	.06	.43	.22	.8531
2810	1717678	1588300	1740999	1908860	-.08	.10	.10	.01	.20	1.1881
2820	682238	726686	782646	838819	.07	.08	.07	.15	.15	1.0000
2910	209154	238928	289195	352783	.14	.21	.22	.38	.48	1.0725
3010	491841	534381	572343	601399	.09	.07	.05	.16	.13	.9741
3110	204752	200044	199035	204714	-.02	-.01	.03	-.03	.02	1.0515
3120	189769	185316	192831	203760	-.02	.04	.06	.02	.10	1.0784
3210	226178	224096	227877	236761	-.01	.02	.04	.01	.06	1.0495
3310	583686	600189	647614	737208	.03	.08	.14	.11	.23	1.1081
3320	337115	351525	416465	480185	.04	.19	.15	.24	.37	1.1048
3410	755952	861374	994560	1166026	.14	.15	.17	.32	.35	1.0227
3420	321224	329580	335273	345541	.03	.02	.03	.04	.05	1.0096
3430	475869	491050	544938	604554	.03	.11	.11	.15	.23	1.0696
3510	331874	332023	328801	336848	.00	-.01	.02	-.01	.01	1.0202
3520	242216	220085	211317	221869	-.09	-.04	.05	-.13	.01	1.1609
3530	136097	130218	130685	135517	-.04	.00	.04	-.04	.04	1.0833
3540	168067	175221	174427	181403	.04	.00	.04	.04	.04	1.0000
3610	447679	449893	458585	475323	.00	.02	.04	.02	.06	1.0392
3710	594749	581701	617272	667986	-.02	.06	.08	.04	.15	1.1058
3810	389653	405520	445917	499014	.04	.10	.12	.14	.23	1.0789
3820	176467	176809	181583	192300	.00	.03	.06	.03	.09	1.0583
3830	197286	194550	193238	200679	-.01	-.01	.04	-.02	.03	1.0510
3910	367439	383774	405169	443575	.04	.06	.09	.10	.16	1.0545
4010	1518451	1515708	1501563	1554303	.00	-.01	.04	-.01	.03	1.0404
4020	1089452	1190758	1348113	1556928	.09	.13	.15	.24	.31	1.0565

Table 2 (continued)

J-SMSA Code	Popultn in 1960	Popultn in 1965	Popultn in 1970	Popultn in 1975	GR1	GR2	GR3	GR4	GR5	$\frac{(GR5 + 1.0)}{(GR4 + 1.0)}$
4030	345890	325751	297188	290578	-.06	-.09	-.02	-.14	-.11	1.0349
4040	462451	425971	456193	466017	-.08	.07	.02	-.01	.09	1.1010
4110	295715	286643	283571	289672	-.03	-.01	.02	-.04	.01	1.0521
4210	506565	523700	545435	592098	.03	.04	.09	.08	.13	1.0463
4220	297099	273533	272294	275682	-.08	.00	.01	-.08	.01	1.0978
4310	625931	640495	671565	718685	.02	.05	.07	.07	.12	1.0467
4320	152094	145623	140809	140020	-.04	-.03	-.01	-.07	-.04	1.0323
4410	474068	491972	520798	587012	.04	.06	.13	.10	.19	1.0818
4510	247866	257218	274925	292209	.04	.07	.06	.11	.14	1.0270
4520	148052	143481	138538	142667	-.03	-.03	.03	-.06	-.01	1.0532
4530	148223	147559	151337	157639	.00	.03	.04	.02	.07	1.0490
4610	490734	515900	543018	601600	.05	.05	.11	.11	.17	1.0541
All J-SMSAs	60256773	66286177	73607621	80690295	.10	.11	.10	.22	.22	1.0000
All J-SMSAs (S.Av)*	-	-	-	-	.04	.06	.08	.11	.15	1.0385
Nation**	93418501	98274961	103720060	110894459	.05	.06	.07	.11	.13	1.0180

Notations: GR1 = 5-year Population Growth Rate from 1960 to 1965
GR2 = 5-year Population Growth Rate from 1965 to 1970
GR3 = 5-year Population Growth Rate from 1970 to 1975
GR4 = 10-year Population Growth Rate from 1960 to 1970
GR5 = 10-year Population Growth Rate from 1965 to 1975

* S.av stands for Simple Average.
** Okinawa Prefecture is excluded.

Table 3 Diversification Index of "Public Expenditure Pattern" and Percentage Share of Public Expenditure by Item for J-SMSAs

J-SMSA Code	DI(11)	Item 1	Item 2	Item 3	Item 4	Item 5	Item 6	Item 7	Item 8	Item 9	Item 10	Item 11
110	.82879	.55	12.72	13.09	8.58	1.15	1.17	3.92	34.43	2.94	13.58	7.87
120	.85345	1.27	11.68	18.70	9.30	4.62	2.81	2.14	21.78	5.19	17.88	4.64
130	.85251	.82	18.12	16.77	6.45	1.12	4.43	2.74	19.13	4.49	20.13	5.79
140	.84493	1.29	12.29	14.18	6.55	4.53	2.88	5.40	25.65	4.29	15.38	7.56
150	.89325	1.21	11.15	16.40	8.72	3.48	3.48	2.44	23.03	4.94	20.14	5.00
160	.82573	1.25	13.43	13.53	7.60	.71	13.78	3.66	22.79	3.45	16.22	3.59
210	.83748	1.14	10.02	18.90	5.76	3.06	4.73	1.44	26.42	4.06	17.17	7.31
220	.84905	1.52	12.49	16.73	4.80	1.20	8.58	2.45	22.50	4.02	21.57	4.14
230	.87929	1.39	11.71	15.07	5.01	.93	6.97	1.72	25.82	3.48	22.33	5.57
310	.87918	1.52	14.79	12.83	5.53	1.23	8.55	1.61	27.91	3.42	18.24	4.38
410	.89698	1.77	14.75	9.67	10.58	1.26	5.78	1.63	25.45	3.36	20.36	5.38
420	.79049	1.76	14.90	7.34	6.16	2.82	11.87	3.69	20.95	4.34	20.35	5.81
510	.82893	2.04	15.07	12.66	5.95	2.18	9.59	1.88	19.11	4.62	21.16	5.74
610	.85251	1.97	16.94	8.69	7.33	1.04	6.04	3.45	21.70	4.51	22.32	6.01
710	.81866	1.75	19.20	10.29	5.96	1.68	9.30	3.57	19.63	4.19	20.39	4.03
720	.84775	2.13	19.79	10.74	7.00	1.39	6.52	2.56	19.89	3.38	21.23	5.36
730	.85766	1.51	14.19	11.27	6.67	2.52	8.57	4.23	20.93	3.20	20.53	6.39
810	.84963	1.85	21.04	9.02	6.68	.43	5.83	2.42	25.55	3.81	19.88	3.48
820	.94724	1.53	12.84	12.51	7.43	.80	4.28	2.77	28.57	3.69	21.64	3.93
910	.87862	1.75	15.03	10.56	6.30	.91	6.74	2.99	23.85	3.93	24.38	3.56
1010	.86313	1.30	10.25	10.69	6.73	2.42	8.00	4.53	29.77	2.77	20.41	3.13
1020	.86820	1.66	12.70	11.81	5.54	.81	6.09	7.20	27.72	3.78	18.77	3.94
1030	.81602	1.26	13.72	11.35	3.97	1.57	2.35	6.16	21.48	2.89	30.90	4.37
1310	.83957	1.29	15.04	15.53	6.77	.55	1.48	1.72	22.45	2.21	29.85	3.13
1410	.84509	.75	11.52	9.01	14.06	1.23	1.37	2.03	31.82	3.75	20.32	4.12
1430	.84399	1.68	15.48	10.99	11.01	.45	5.12	4.90	21.09	5.05	21.45	2.79
1510	.88136	1.44	13.37	13.41	10.28	1.63	4.61	4.37	21.10	3.91	18.84	7.05
1520	.91223	1.40	15.22	12.16	7.99	1.54	3.76	4.39	23.67	3.77	18.90	7.19
1610	.81654	1.39	15.81	13.05	6.47	1.65	9.06	5.52	21.99	3.71	14.60	6.74
1620	.86030	1.60	13.74	13.48	7.31	1.88	8.18	2.96	23.72	3.89	15.75	7.48
1710	.80936	1.25	5.67	12.92	7.52	1.09	6.30	3.71	37.04	2.25	17.18	5.06
1810	.84261	1.42	13.63	13.88	5.99	.85	8.98	6.50	21.80	3.45	18.66	4.83
1910	.82652	1.71	21.34	13.31	9.18	.64	7.35	1.79	21.42	2.72	16.14	4.41
2010	.85354	1.06	13.51	12.69	6.13	1.02	10.72	4.03	21.05	2.74	21.72	5.34
2020	.75243	1.35	16.30	13.34	4.90	.83	15.23	3.65	17.66	2.77	17.24	6.76
2110	.88443	1.83	16.72	11.91	7.79	.82	6.82	2.87	22.94	3.71	21.32	3.28

Table 3 (continued)

J-SMSA Code	DI(11)	Item 1	Item 2	Item 3	Item 4	Item 5	Item 6	Item 7	Item 8	Item 9	Item 10	Item 11
2210	.89076	1,17	12,94	7,98	10,79	.75	6,01	3,10	28,18	3,43	20,73	4,93
2220	.81850	1,30	16,71	7,18	8,13	,84	10,36	2,89	28,34	3,67	17,73	2,86
2230	.84320	1,24	17,82	9,46	5,70	.77	7,04	1,81	23,49	3,36	25,74	3,56
2240	.85929	1,19	14,37	8,09	10,22	,46	7,71	2,04	27,09	3,11	19,18	6,54
2310	.92110	,95	14,49	10,86	8,82	.81	2,78	2,75	31,18	3,58	20,09	3,69
2320	.88072	1,40	11,87	13,38	5,85	1,08	7,66	4,50	25,40	3,42	22,24	3,19
2330	.91496	.90	14,96	11,93	7,43	1,40	4,23	4,26	24,49	2,71	24,68	3,02
2410	.69716	1,20	35,92	10,71	5,43	2,76	5,10	,74	20,44	2,46	13,23	2,01
2430	.79653	1,96	17,59	14,62	7,42	2,42	10,91	1,91	17,52	3,50	18,94	3,21
2510	.84218	1,40	19,49	8,30	5,28	1,07	6,19	1,43	29,45	3,16	20,21	4,03
2610	.87864	,67	9,88	14,69	11,14	2,95	1,31	3,71	27,51	3,58	20,31	4,25
2710	.87936	,73	11,51	10,62	9,02	1,05	1,14	2,56	32,69	2,53	21,15	6,98
2810	.79469	,55	9,92	9,42	9,50	1,56	2,31	2,64	41,07	2,73	13,12	7,20
2820	.92608	1,42	12,34	9,70	8,01	2,05	4,93	2,74	28,87	2,76	21,32	5,86
2910	.87364	1,24	12,76	13,41	9,02	3,27	2,81	,49	22,08	2,74	26,98	5,19
3010	.86076	1,51	16,82	12,61	8,57	,78	9,29	2,82	21,99	3,10	17,47	5,04
3110	.80274	2,32	13,76	14,62	6,10	1,05	12,54	4,28	22,54	2,27	14,95	5,58
3120	.78237	2,15	13,88	15,47	5,26	2,38	10,69	7,68	20,63	2,28	15,37	4,20
3210	.81542	1,64	12,12	9,67	6,06	,78	13,49	5,99	23,23	2,72	18,21	6,08
3310	.90812	1,45	13,89	14,04	6,94	2,56	6,60	2,81	22,21	2,92	21,91	4,67
3320	,83517	,86	12,26	11,46	6,14	3,22	5,77	8,16	23,05	2,00	24,49	2,60
3410	,91179	1,29	12,90	10,58	9,71	3,89	3,85	3,35	26,79	4,33	19,72	3,59
3420	,74621	1,69	12,95	13,04	10,31	9,65	8,58	3,88	16,79	3,67	14,23	5,20
3430	,87846	1,32	13,70	12,38	7,44	2,32	5,60	7,73	22,19	2,67	21,27	3,38
3510	,92628	1,32	12,40	11,03	8,97	3,02	5,47	2,47	28,69	3,12	19,12	4,39
3520	,83004	1,32	18,10	13,99	6,14	5,32	5,59	1,77	26,82	2,68	13,65	4,64
3530	.78136	1,44	23,42	14,51	4,07	1,58	7,86	2,18	21,18	2,62	15,10	6,04
3540	.90849	1,58	12,94	11,28	6,83	2,33	6,93	4,59	26,65	3,29	19,68	3,91
3610	.88067	1,84	12,33	14,65	5,47	3,71	5,96	2,13	27,57	3,57	17,89	4,87
3710	,88345	1,76	14,18	13,71	5,41	3,32	8,09	2,12	24,85	2,98	19,50	4,08
3810	,86226	1,56	17,16	17,15	5,61	1,59	6,80	2,55	23,66	2,66	17,52	3,73
3820	.80428	2,50	19,86	14,57	4,31	1,76	8,04	1,13	22,60	3,25	16,56	5,43
3830	.73994	1,71	19,47	16,08	5,40	10,05	5,11	1,75	15,23	3,18	18,07	3,96
3910	,75376	1,44	11,61	26,23	8,17	5,42	5,57	1,76	17,45	2,72	14,89	4,74
4010	,81044	,93	12,27	19,94	9,85	5,78	2,71	2,25	27,26	2,38	13,26	3,37
4020	,89503	1,06	11,57	13,42	9,26	3,13	5,15	3,15	30,46	2,80	16,64	3,37

Table 3 (continued)

J-SMSA Code	DI(11)	Item 1	Item 2	Item 3	Item 4	Item 5	Item 6	Item 7	Item 8	Item 9	Item 10	Item 11
4030	.67869	1.57	11.67	25.62	9.42	11.79	3.67	1.96	14.58	3.04	13.53	3.15
4040	.85295	1.89	16.52	15.59	4.81	2.68	7.12	3.02	22.36	3.64	18.54	3.83
4110	.79174	2.20	16.65	12.56	4.78	4.42	11.02	1.93	24.31	3.48	14.56	4.09
4210	.84607	1.25	12.39	19.17	10.20	2.27	6.28	3.02	22.54	3.69	15.22	3.97
4220	.74532	.97	16.13	21.52	9.75	4.00	3.89	5.53	18.34	3.06	10.79	4.01
4310	.80346	1.52	14.83	18.87	8.50	3.09	6.24	2.87	28.25	3.37	8.89	3.58
4320	.66257	1.64	22.26	20.96	3.25	4.67	9.65	4.71	11.36	2.10	15.34	4.08
4410	.85805	1.60	14.49	15.62	6.75	4.19	6.81	3.60	23.42	3.02	16.07	4.41
4510	.79104	1.73	15.49	18.92	5.35	2.22	10.14	1.51	22.47	2.84	14.27	5.07
4520	.73430	1.09	11.69	14.97	2.99	4.83	17.77	1.36	23.36	2.27	15.51	4.17
4530	.75995	1.20	10.12	13.46	5.39	2.84	18.31	3.27	18.43	3.42	19.30	4.27
4610	.82936	1.54	13.81	15.14	9.56	6.84	5.37	1.46	18.49	3.29	19.50	5.00
All J-SMSAs	1.00000	1.13	13.57	12.41	8.31	1.67	3.64	2.71	27.16	2.95	21.27	4.69
All J-SMSAs (S.Av)*	.83826	1.44	14.70	13.47	7.24	2.46	6.83	3.21	23.92	3.31	18.73	4.69
Nation**	-	1.38	14.63	12.16	7.93	1.60	6.78	2.59	24.49	3.28	20.44	4.73

Notation: DI(11) = Diversification Index of "Public Expenditures Pattern"

Item 1 = Expenses for Assembly Arrangement
Item 2 = Expenses for General Affairs
Item 3 = Expenses for Social Welfare
Item 4 = Expenses for Health
Item 5 = Expenses Relating to Unemployment
Item 6 = Expenses for Agro-forestry-fishery Projects
Item 7 = Expenses for Commerce and Industrial Activities
Item 8 = Expenses for Construction Projects
Item 9 = Expenses for Fire Service
Item 10 = Expenses for Education
Item 11 = Expenses Relating to the Public Bonds

* S.Av stands for Simple Average.

** Okinawa Prefecture is excluded. The total public expenditure level was ¥5,377,651,000,000 (= US$17,926,000,000) excluding the public expenditures for the rest of the items which total to about ¥131,520,000,000

Table 4 Diversification Index of "Industrial Employment Pattern," Percentage Share of Employment by Industry and Diversification Index Ratio for J-SMSAs

J-SMSA Code	DI(13)	Item 1	Item 2	Item 3	Item 4	Item 5	Item 6	Item 7	Item 8	Item 9	Item 10	Item 11	Item 12	Item 13	DI(11)/DI(13)
110	.74053	3.42	.23	.35	.33	12.58	13.95	28.49	3.14	1.20	9.23	.61	20.15	6.34	1.119
120	.75477	6.65	.59	2.90	.18	8.82	17.05	24.70	2.37	.50	11.36	.58	19.37	4.93	1.088
130	.81461	10.86	.68	.01	.23	10.17	15.27	26.49	2.66	.73	8.77	.60	17.86	5.66	1.047
140	.79189	3.52	.13	1.22	.19	11.70	23.60	21.50	1.90	.46	13.31	.72	18.39	3.39	1.067
150	.68276	2.09	.94	4.24	4.58	9.87	15.58	24.86	2.42	.93	11.71	.73	17.43	4.62	1.308
160	.69314	20.64	1.40	.05	.33	10.06	9.37	23.55	1.84	.68	6.52	.44	18.63	6.47	1.191
210	.72586	15.41	.95	1.50	.09	10.17	9.27	24.20	2.71	.46	8.98	.64	17.99	6.63	1.154
220	.55809	40.88	.45	.31	.13	7.29	7.66	17.39	1.57	.30	4.76	.31	15.94	3.01	1.521
230	.72378	20.46	.10	7.12	.23	9.21	16.38	18.93	1.39	.31	6.41	.59	13.73	5.14	1.215
310	.66025	27.90	.61	.03	.20	7.19	9.65	20.28	2.43	.34	7.26	.64	18.34	5.15	1.332
410	.81223	15.85	.10	1.33	.13	8.54	15.53	23.90	2.74	.46	7.69	.86	17.47	5.39	1.104
420	.69774	22.53	.28	11.93	.15	6.33	18.10	17.22	1.35	.13	5.68	.44	11.95	3.92	1.133
510	.70420	24.55	1.06	.76	.47	9.05	12.11	19.86	2.34	.31	7.96	.71	16.13	4.69	1.177
610	.75770	27.71	.22	.04	.08	6.41	20.04	18.38	2.27	.21	4.52	.48	14.88	4.76	1.125
710	.78288	26.10	.20	.02	.15	5.66	21.83	17.40	2.01	.21	5.42	.59	15.69	4.71	1.046
720	.74458	28.86	.43	.01	.38	6.46	19.59	19.04	1.49	.17	4.94	1.09	15.04	2.49	1.139
730	.76824	29.09	.13	.04	.33	6.22	20.50	18.36	1.90	.21	6.02	.40	13.93	2.89	1.116
810	.77496	26.74	.10	1.10	.22	5.66	20.37	18.31	2.06	.30	5.63	.51	14.87	4.12	1.096
820	.79258	13.12	.30	1.01	2.81	6.18	40.69	14.07	1.03	.37	4.89	.51	12.93	2.09	1.195
910	.81020	25.58	.24	.03	.75	6.17	24.05	18.74	1.90	.28	4.82	.45	13.16	3.83	1.084
1010	.83290	20.86	.36	.06	.09	7.05	23.52	20.10	2.56	.30	4.39	.85	16.11	3.73	1.036
1020	.81827	24.32	.17	.04	.26	5.81	27.37	18.34	1.65	.27	6.52	.42	12.24	2.59	1.061
1030	.76392	9.52	.24	.04	.07	4.99	49.15	17.46	1.36	.14	3.48	.38	11.62	1.54	1.068
1310	.91825	4.97	.02	.10	.09	7.84	32.13	23.66	3.25	1.13	6.36	.55	16.59	3.31	.914
1410	.86147	2.46	.01	.31	.05	8.40	35.26	20.08	2.75	.83	9.14	.73	16.09	3.87	.981
1430	.91625	10.25	.15	.41	.39	7.70	28.89	18.61	2.38	.35	7.64	.69	20.08	2.47	.921
1510	.80963	20.25	.06	.32	.31	7.96	17.74	22.25	2.38	.34	7.34	.73	16.27	4.06	1.089
1520	.83685	22.18	.07	.03	.69	5.87	26.20	20.94	2.24	.28	5.19	.49	13.84	1.97	1.090
1610	.85859	21.14	.16	.53	.17	7.66	25.26	19.41	2.07	.26	5.14	1.33	14.01	2.86	.951
1620	.82024	23.04	.05	.77	.14	7.36	29.10	16.86	1.49	.12	5.44	.53	12.60	2.50	1.049
1710	.93399	13.88	.05	.22	.06	7.26	27.10	21.65	2.89	.35	6.49	.49	16.22	3.33	.867
1810	.83806	20.72	.18	.20	.13	6.26	31.14	17.46	2.03	.20	4.70	.54	13.59	2.84	1.005
1910	.80353	25.55	.25	.02	.19	6.18	22.92	19.61	2.21	.26	4.44	.61	14.50	3.26	1.029
2010	.80330	25.13	.32	.02	.10	6.96	22.07	17.73	2.26	.28	6.63	.67	14.10	3.73	1.063
2020	.80413	27.06	.29	.06	.09	6.05	24.74	18.13	1.70	.16	4.75	.64	13.55	2.78	.936
2110	.86706	13.51	.06	.03	.15	6.18	38.64	18.45	2.12	.34	4.71	.49	12.50	2.83	1.020

Table 4 (continued)

I-SMSA Code	DI(13)	Item 1	Item 2	Item 3	Item 4	Item 5	Item 6	Item 7	Item 8	Item 9	Item 10	Item 11	Item 12	Item 13	DI(11) / DI(13)
2210	.93064	13.25	.31	.98	.14	7.45	30.55	21.60	2.43	.45	6.21	.56	13.63	2.44	.957
2220	.82269	17.33	.24	.52	.08	5.71	38.07	16.63	1.54	.30	4.86	.35	11.98	2.40	.995
2230	.94445	10.34	.10	.70	.05	7.40	32.29	20.05	2.02	.40	7.33	.55	14.41	4.34	.893
2240	.83760	12.90	.26	.10	.20	7.73	40.36	16.43	1.58	.36	6.21	.42	11.84	1.62	1.026
2310	.87339	7.78	.03	.15	.08	6.80	39.49	21.24	2.11	.54	6.23	.66	12.75	2.15	1.055
2320	.84433	19.03	.07	.75	.14	6.68	32.68	17.82	1.63	.31	4.68	.49	13.09	2.62	1.043
2330	.76189	12.30	.07	.02	.34	6.07	48.26	14.10	1.36	.29	3.67	.52	11.06	1.94	1.201
2410	.80856	23.56	.15	.91	.08	6.56	22.11	17.73	2.03	.30	5.66	.77	15.31	4.82	.862
2430	.83875	16.40	.13	4.81	.26	5.39	26.10	18.48	1.51	.20	6.57	.36	16.77	3.01	.950
2510	.86586	17.91	.11	.54	.11	6.62	30.41	16.13	1.86	.36	6.50	.54	14.91	4.01	.973
2610	.88813	4.38	.11	.01	.06	6.47	33.12	24.90	2.66	.62	5.66	.54	18.41	3.07	.989
2710	.85243	2.81	.03	.05	.03	8.19	37.47	24.01	2.84	.92	6.65	.60	13.94	2.46	1.032
2810	.88620	3.97	.02	.29	.04	7.41	31.79	22.89	2.82	.74	10.73	.54	15.34	3.43	.897
2820	.86606	12.54	.18	.35	.20	8.11	36.61	17.29	1.85	.31	6.97	.66	12.12	2.82	1.045
2910	.85363	14.25	.10	.02	.03	7.10	20.93	20.94	3.39	.73	6.38	.81	20.63	4.69	1.023
3010	.91157	15.02	.07	.70	.10	6.63	30.31	19.17	2.41	.38	7.64	.64	13.64	3.28	.944
3110	.75486	26.72	.34	1.46	.08	6.47	20.03	15.83	1.95	.26	5.26	.63	16.73	4.23	1.063
3120	.73265	25.45	.13	.95	.10	6.95	16.31	18.39	1.58	.22	8.07	.40	16.57	4.87	1.068
3210	.69377	28.22	.16	1.62	.62	6.85	14.31	19.06	2.36	.21	4.48	.65	17.34	4.13	1.175
3310	.85711	19.92	.05	.35	.18	7.48	22.45	20.75	2.13	.43	6.48	.57	15.82	3.39	1.060
3320	.81099	14.90	.02	.60	.13	8.84	40.19	14.11	1.28	.23	5.91	.54	11.38	1.87	1.030
3410	.91890	6.81	.08	.56	.13	8.64	26.93	23.83	2.85	.66	7.86	.79	16.43	4.43	.992
3420	.84462	8.29	.04	1.25	.18	7.31	33.38	16.08	1.82	.15	7.44	.53	13.93	9.59	.883
3430	.86898	14.20	.05	1.03	.22	7.75	35.34	17.94	1.47	.24	6.68	.47	12.61	1.98	1.011
3510	.81956	12.67	.06	4.03	.16	7.97	19.82	20.92	2.89	.25	12.27	.59	15.09	3.27	1.130
3520	.58259	11.83	.03	1.98	.40	10.89	24.82	20.45	1.77	.19	7.65	1.20	16.07	2.71	.940
3530	.62240	27.32	.22	.33	.23	5.41	8.75	19.37	1.91	.19	7.07	.97	19.26	8.97	1.255
3540	.90826	12.30	.15	.68	.36	9.88	30.26	17.80	1.44	.22	7.80	.63	15.28	3.22	1.000
3610	.86266	19.29	.20	1.29	.25	7.18	24.27	18.83	2.22	.30	6.05	.51	15.50	4.11	1.021
3710	.84872	19.74	.04	1.36	.26	6.87	22.67	19.59	2.41	.37	6.86	.77	15.40	3.66	1.041
3810	.80654	19.57	.22	.73	.06	7.78	17.81	21.09	2.52	.39	7.29	.56	17.74	4.23	1.069
3820	.82848	18.93	.10	1.51	.07	7.54	32.63	16.80	1.51	.19	5.57	.43	12.67	2.04	.971
3830	.86253	13.64	.39	1.80	.83	8.94	31.67	16.58	1.73	.19	6.26	1.52	14.28	2.18	.858
3910	.78616	16.63	.48	1.07	.38	7.42	16.29	22.42	2.38	.44	6.00	.57	19.62	4.31	.959
4010	.88074	7.35	.04	.57	.83	10.04	25.44	21.57	2.02	.44	10.34	.73	16.52	4.11	.920
4020	.83844	10.13	.06	.99	.11	9.46	16.05	27.24	3.02	.97	7.77	.71	19.39	4.11	1.067

Table 4 (continued)

J-SMSA Code	DI(13)	Item 1	Item 2	Item 3	Item 4	Item 5	Item 6	Item 7	Item 8	Item 9	Item 10	Item 11	Item 12	Item 13	DI(11)/DI(13)
4030	.74215	16.45	.02	3.86	6.01	8.38	18.30	18.46	1.38	.22	5.58	.79	14.89	5.66	.914
4040	.77345	27.01	.09	.06	.15	5.72	20.96	19.36	1.67	.29	5.22	.34	15.06	4.06	1.102
4110	.72490	25.29	.05	2.12	.49	6.91	15.49	20.45	2.28	.24	4.84	.74	16.45	4.65	1.092
4210	.85188	9.40	.04	3.28	.12	8.28	19.80	24.28	2.83	.42	7.33	.70	19.06	4.44	.993
4220	.82474	9.90	.05	1.15	.68	7.97	18.13	24.84	2.52	.27	7.07	.79	19.20	7.41	.904
4310	.73242	20.28	.28	.99	.14	7.13	12.33	23.21	2.48	.47	6.37	.57	19.11	6.64	1.097
4320	.72787	28.02	.93	1.42	.46	7.02	16.63	20.08	1.25	.18	5.93	.51	14.68	2.87	.910
4410	.76007	18.04	.10	1.15	.21	9.29	13.38	21.23	2.32	.50	7.47	.81	20.16	5.34	1.129
4510	.66988	24.81	.52	.47	.14	8.28	8.20	23.85	2.47	.55	5.24	.89	19.72	4.85	1.181
4520	.61741	36.67	.51	.10	.10	6.61	12.43	18.24	1.24	.23	3.66	.40	14.38	5.43	1.189
4530	.87487	13.30	1.01	2.26	.20	9.95	29.89	19.31	1.32	.20	4.43	.52	14.66	2.96	.869
4610	.78574	17.44	.19	.52	.13	8.23	13.87	23.51	2.67	.59	7.85	.70	18.68	5.61	1.056
All J-SMSAs	1.00000	10.28	.11	.47	.19	7.75	29.70	21.87	2.58	.69	6.75	.61	15.55	3.44	1.000
All J-SMSAs (S.Av)*	.80510	17.43	.24	1.07	.37	7.58	24.06	20.02	2.10	.38	6.60	.63	15.61	3.91	1.050
Nation**	-	17.91	.41	1.04	.43	7.57	25.98	19.31	2.21	.52	6.17	.55	14.66	3.30	-

Notations: DI(11) = Diversification Index of "Public Expenditure Pattern"
DI(13) = Diversification Index of "Industrial Employment Pattern"
Item 1 = Agriculture
Item 2 = Forestry and Hunting
Item 3 = Fishery and Aquiculture
Item 4 = Mining
Item 5 = Construction
Item 6 = Manufacturing
Item 7 = Wholesale and Retail Trade
Item 8 = Finance and Insurance
Item 9 = Real Estate
Item 10 = Transport and Communication
Item 11 = Electricity, Gas and Water
Item 12 = Services
Item 13 = Government

* S.av stands for Simple Average.
** Okinawa Prefecture is excluded. The number of total employed persons in 1970 was 52,110,190.

which is equivalent to

$$\left(\frac{\text{population in 1975}}{\text{population in 1970}}\right) \Big/ \left(\frac{\text{population in 1965}}{\text{population in 1960}}\right) = \text{GRR}$$

This value indicates the population growth rate observed during the period from 1970 to 1975 as compared with that during the period from 1960 to 1965. If this growth rate ratio (GRR) is less than one for a specific J-SMSA, it means that the J-SMSA's growth rate declined in the last five years.

Table 3 gives the percentage distribution of local-government public expenditures by expense category. The eleven categories used are: assembly arrangement, general affairs, social welfare, health, unemployment matters, agro-forestry-fishery projects, commerce and industrial activities, construction projects, fire service, education, and public bonds. For all J-SMSAs, outlays for construction projects account for 27.16 percent of the total, followed by education, general affairs, and social welfare, which account for 21.27 percent, 13.57 percent, and 12.41 percent respectively.

In the second column of Table 3 are shown the diversification indices of the Public Expenditure Pattern, denoted by DI(11). The values were calculated on the basis of modifications made in turn by Isard (1960, pp.270-277) and Douglas (1967, pp.11 ff.), of Rodgers (1957) initial work in this area. The higher the value of the index (which will be discussed briefly in the next section) the more similar is the structure to the average degree of diversification.

Table 4 shows the percentage distribution of employment by industry sector for the following sectors: agriculture; forestry and hunting; fishery and agriculture; mining; construction; manufacturing; wholesale and retail trade; finance and insurance; real estate; transport and communication; electricity, gas and water; services; and government. For all J-SMSAs, manufacturing accounts for the highest share of employment (29.70 percent), followed by wholesale and retail trade, services, and agriculture, with 21.87 percent, 15.55 percent, and 10.28 percent

respectively. The Industrial Employment Pattern diversification indices--denoted by DI(13)--are given in the second column so that the employment structure of each J-SMSA can be compared with the average of all the J-SMSAs. In the last column are shown the values of the ratio which indicates the diversification of the budgetary structure in relation to the diversification of the employment structure of each J-SMSA.

IV. Diversification Index

The diversification index is calculated by comparing each J-SMSA's budget-expense structure with the average structure of all 84 J-SMSAs. In order to obtain the diversification index, we calculate a concentration index for each budget-expense category in each J-SMSA and then rank the categories in terms of this index. The concentration index for budget-expense category j in J-SMSA$_i$ is the percentage share of J-SMSA$_i$'s budget-expense for category j divided by the percentage share of budget-expense in all 84 J-SMSAs accounted for by category j. Accordingly,

$$CI_{ij} = \frac{BE_{ij} \Big/ \sum_{j=1}^{11} BE_{ij}}{\sum_{i=1}^{84} BE_{ij} \Big/ \sum_{i=1}^{84}\sum_{j=1}^{11} BE_{ij}} = \frac{S_{ij}}{TS_{ij}}$$

where CI_{ij} = Concentration index for J-SMSA$_i$'s budget-expense for category j.

BE_{ij} = J-SMSA$_i$'s budget-expense for category j.

$$S_{ij} = \left(BE_{ij} \Big/ \sum_{j=1}^{11} BE_{ij}\right) \times 100$$

$$TS_{ij} = \left(\sum_{i=1}^{84} BE_{ij} \Big/ \sum_{i=1}^{84}\sum_{j=1}^{11} BE_{ij}\right) \times 100$$

The construction of a Lorenz curve for each J-SMSA requires the ranking of budget-expense categories by concentration index.

That is, the points representing the cumulative values of the numerator (S_{ij}) on the vertical axis and of the denominator (TS_j) on the horizontal axis are plotted in the decreasing order of the concentration index. This means that the point for the budget-expense category whose S_{ij} is largest relative to its TS_j (i.e., the item with the highest value of CI_{ij}) will be closest to the vertical axis, the second largest will come next, and so forth. If one connects these points in order by lines from the point (0, 0) to the point (100, 100), one gets a curve (strictly, kinked-line) which is convex upwards and which tends to rise rapidly from the point (0, 0) and then flatten with its end at the point (100, 100). This Lorenz curve is contained in a quadrate box; the diversification index is defined as the difference between the total area of this box and the area under the Lorenz curve, divided by the area above the 45 degree line.

In view of the nature of the diversification index, if a J-SMSA's budget-expense structure is completely diversified in the sense that all of its concentration indices are equal to one, then its Lorenz curve falls on the 45 degree line, i.e. the diversification index is equal to one. If, at the other extreme, all the public expenditures in a J-SMSA are concentrated on only one budget-expense category, then one gets an extremely low diversification index for the J-SMSA.

The diversification index is useful for research in which one wants to compare the structure (not only the budget-expense structure but also almost any type of structure) of each J-SMSA with the typical average structure of all the J-SMSAs. However, it should be noted that the significance of the diversification index can only be determined in relation to other socio-economic variables because of the fact that there is nothing inherently good or bad about a particular level of diversification (Douglas, 1967, p.13).

V. Changes in the Spatial Population Structure of Japan

As shown in Table 1, Japan can be divided into four geographic regions: Hokkaido, Honshu, Shikoku and Kyushu, each

of which corresponds to one of the country's four major islands. The Honshu region is divided, in turn, into two regions: Honshu (I) and Honshu (II). The Honshu (I) region is identical with the Tokaido-Sanyo-Megalopolis, along which various types of activities are highly concentrated. The Honshu (II) region covers the rest of the area of Honshu Island, the Non-Tokaido-Sanyo-Megalopolis region. The Hokkaido, Honshu (I), Honshu (II), Shikoku and Kyushu regions have 6, 25, 33, 6, and 14 J-SMSAs respectively.

Table 2 shows the population levels, growth rates, and growth rate ratios for the J-SMSAs. The 1970 populations of the ten largest J-SMSAs are as follows:

1310	TOKYO	B	POPULATION = 18897712
2710	OSAKA	B	POPULATION = 9521577
2310	NAGOYA	B	POPULATION = 4248982
1410	YOKOHAMA	B	POPULATION = 3558172
2610	KYOTO	B	POPULATION = 1809412
2810	KOBE	B	POPULATION = 1740999
4010	KITAKYUSHU	E	POPULATION = 1501563
4020	FUKUOKA	E	POPULATION = 1348113
110	SAPPORO	A	POPULATION = 1310693
410	SENDAI	C	POPULATION = 1019991

It should be noted that the six largest J-SMSAs in terms of population size are located in region B, the Tokaido-Sanyo-Megalopolis.

The following J-SMSAs had the highest values of 10-year population growth rates from 1960 to 1970 (GR4) and from 1965 to 1975 (GR5), respectively.

1410	YOKOHAMA	B	GR4 = .59
110	SAPPORO	A	GR4 = .48
2710	OSAKA	B	GR4 = .43
2330	TOYOTA	B	GR4 = .43
2910	NARA	C	GR4 = .38

2910	NARA	C	GR5 = .48
1410	YOKOHAMA	B	GR5 = .48
110	SAPPORO	A	GR5 = .45
2330	TOYOTA	B	GR5 = .44
3320	KURASHIKI	B	GR5 = .37

The Nara J-SMSA has drastically increased its population size in the past fifteen years because of its strong tendency to become a dormitory community for people who work in either the Osaka or the Kyoto J-SMSA during the daytime. The Yokohama J-SMSA still continues to grow rapidly, as does the Sapporo J-SMSA, which attracts people from the neighboring areas in Hokkaido Island.[3]

The Toyota J-SMSA's boom is due to the existence of active automobile manufacturing industries. The Kurashiki J-SMSA rose to the fifth position during the last five years as a consequence of recent suburbanization around the Okayama J-SMSA.

With regard to the growth rate ratio (GRR) shown in the last column of Table 2, it is instructive to examine the J-SMSAs with a ratio less than one:

2710	OSAKA	B	GRR = .8532
140	MURORAN	A	GRR = .9068
1410	YOKOHAMA	B	GRR = .9245
1310	TOKYO	B	GRR = .9259
2430	ISE	C	GRR = .9418
160	OBIHIRO	A	GRR = .9496
1430	ODAWARA	B	GRR = .9504
150	KUSHIRO	A	GRR = .9667
3010	WAKAYAMA	C	GRR = .9741
110	SAPPORO	A	GRR = .9797
2230	NUMAZU	B	GRR = .9843
2110	GIFU	B	GRR = .9916

[3]For the justification of this statement see Table 5-b.

The Osaka J-SMSA had the largest reduction in growth, mainly because it grew by 43 percent during the ten-year period from 1960 to 1970, but only by 22 percent from 1965 to 1975. It also is interesting that no J-SMSAs from the Shikoku and Kyushu regions had ratios less than one and that only two J-SMSAs out of the 33 J-SMSAs located in the non-Tokaido-Sanyo-Megalopolis region had a ratio less than one.

Table 3 gives the percentage distribution of local government public expenditures by budget-expense category and the diversification index for the budget-expense structure. Concerning the expenses for construction projects, DI(11, 8), which accounts for the highest percentage share (27.16 percent) for all J-SMSAs, the J-SMSAs with the five highest values are as follows:

2810	KOBE	B	DI(11, 8) = 41.07
1710	KANAZAWA	C	DI(11, 8) = 37.04
110	SAPPORO	A	DI(11, 8) = 34.43
2710	OSAKA	B	DI(11, 8) = 32.69
1410	YOKOHAMA	B	DI(11, 8) = 31.82

It is remarkable that except for the Kanazawa J-SMSA, whose 1970 population was 540,268, each of the other four J-SMSAs had 1970 populations over one million. One would not necessarily expect to find a high correlation between 1970 population and the percentage distribution of expenses for construction projects, but the relevant correlation coefficients (Table 6) are 0.82, 0.55, 0.70 and 0.50 for the J-SMSAs in Hokkaido, Shikoku, Kyushu and Japan as a whole, respectively.

With regard to the diversification index of the budget-expense structure, the five highest-ranking J-SMSAs are as follows:

2210	SHIZUOKA	B	DI(11) = .89076
2110	GIFU	B	DI(11) = .88443
3710	TAKAMATSU	D	DI(11) = .88345
1510	NIIGATA	C	DI(11) = .88136
2320	TOYOHASHI	B	DI(11) = .88072

The Shizuoka J-SMSA has the most typical structure of public expenditures. On the other hand, the Yatsushiro J-SMSA, in the Kyushu region, has the lowest diversification index (0.66237), indicating that its budget-expense structure is unique when compared with the average structure of all 84 J-SMSAs.

Table 4 gives the diversification index of the industrial employment pattern for each J-SMSA. The five highest-ranking J-SMSAs are:

2230	NUMAZU	B	DI(13) = 0.94445
1710	KANAZAWA	C	DI(13) = 0.93399
2210	SHIZUOKA	B	DI(13) = 0.93064
3410	HIROSHIMA	B	DI(13) = 0.91890
1310	TOKYO	B	DI(13) = 0.91825

The Numazu J-SMSA has the most typical structure with respect to the industrial employment pattern. The Shizuoka J-SMSA, which has the highest diversification index for the budget-expense structure, is ranked third in this instance. Table 4 also indicates that among the J-SMSAs with the smallest diversification indices are Hirosaki (0.55809), Miyakonojo (0.61741), Yamaguchi (0.62240), Morioka (0.66025), and Miyazaki (0.66988). They are located at some distance from the Tokyo-Osaka industrial belt.

The argument is sometimes made that a J-SMSA with a high level of employment diversification is economically healthy because of the fact that the magnitude of its local economic activities need not depend on the success or failure of one or two major industrial sectors. On the other hand, it could be argued that the rapidly-growing J-SMSAs will generally tend to have their employment concentrated in high-growth industrial sectors, and thus they would tend to have lower diversification indices. The data in Table 6 indicate that this last hypothesis is plausible concerning both the Shikoku region's metropolitan system and the J-SMSAs in the 1,000,000 - 4,999,999 population-size group; the respective correlation coefficients are -0.78 and -0.51 for the 5-year population growth rate and the employment structure diversification index.

A third argument is that there is a tendency for larger J-SMSAs to be more diversified. This hypothesis seems to be reasonable for the metropolitan systems in the Shikoku, and Kyushu regions regarding the budget-expense structure, and for the Kyushu regions regarding the employment structure. The relevant correlation coefficients (Table 6) are 0.69, 0.73, and 0.51, respectively.

Table 4 also gives the percentage distribution of employment by industry. For all J-SMSAs manufacturing accounts for the highest share of employment, 29.70 percent. The five highest-ranking J-SMSAs for manufacturing industry DI(13,6) are:

1030	KIRYU	C	DI(13,6) = 49.15
2330	TOYOTA	B	DI(13,6) = 48.26
820	HITACHI	C	DI(13,6) = 40.69
2240	FUJI	B	DI(13,6) = 40.36
3320	KURASHIKI	B	DI(13,6) = 40.19

Each of these five J-SMSAs is located in the Honshu region, and each has its own particularly specialized industrial sectors; textile mill products for the Kiryu and Kurashiki J-SMSAs; motor vehicles and motor vehicle equipment for the Toyota J-SMSA; ordinary and electrical machinery, equipment and supplies for the Hitachi J-SMSA; and pulp, paper and finished allied products for the Fuji J-SMSA.

The last column of Table 4 compares the budgetary structure and the employment structure for each J-SMSA. The J-SMSAs with the five highest values of this diversification index ratio (DIR) and those with the five lowest values are:

220	HIROSAKI	C	DIR = 1.52135
310	MORIOKA	C	DIR = 1.33159
150	KUSHIRO	A	DIR = 1.30829
3530	YAMAGUCHI	B	DIR = 1.25540
230	HACHINOHE	C	DIR = 1.21486

3830	NIIHAMA	D	DIR = 0.85787
2410	TSU	C	DIR = 0.86222
1710	KANAZAWA	C	DIR = 0.86656
4530	NOBEOKA	E	DIR = 0.86864
3420	KURE	B	DIR = 0.88349

The J-SMSAs in the first group (except for the Yamaguchi J-SMSA) are located in the northern part of Japan, while all those in the second group are in the south-western part. In the correlation coefficient matrix in Table 6, one sees a high correlation (0.75) between DIR and 1970 population in the Shikoku region, while a significant negative correlation (-0.50) exists between DIR and 1970 population for the J-SMSAs in the 750,000 - 1,000,000 population size-class. It can also be seen that in the Shikoku region there is a rather high correlation coefficient between the growth rate ratio (GRR) and diversification index ratio (DIR). These findings suggest that it would be worthwhile to attempt to carry out further exploratory research on spatial population structure by use of the DIR.

The data in Tables 5-a through 5-g permit a brief interregional comparative investigation. Examining the growth rates of population for all J-SMSAs in each region in Table 5-a, it is seen that the fastest-growing regions from 1960 to 1970 expanded less rapidly during the period from 1965 to 1975. The Hokkaido region grew by 30 percent in the former period and by 29 percent in the latter period. The Tokaido-Sanyo-Megalopolis growth rate was reduced from 30 percent to 26 percent. On the other hand, the slowly-growing regions during the former period--such as the non-Tokaido-Sanyo-Megalopolis, Shikoku and Kyushu regions--increased their growth rates in the latter period from 8 percent to 13 percent, 6 percent to 13 percent and 5 percent to 11 percent respectively. A similar tendency can be seen in the simple average growth rates shown in Table 5-a. The Kyushu region had a four-fold increase in its growth rate while the Shikoku region's growth rate more than doubled.

It is important to keep in mind that the comparisons just made involved a sort of "moving-average" growth rate so that a

Table 5-a Population and Diversification Index for J-SMSAs by Region

Characteristics \ Region	J-SMSA Area A	B	C	D	E	Nation
(a) No. of J-SMSAs	6	25	33	6	14	84
Population						
(b) 1960	1989939	37974573	11316397	2173273	6802591	60256773
(c) 1965	2256495	43362010	11591113	2192247	6884312	66286177
(d) 1970	2593990	49335000	12231521	2301764	7145347	73607621
(e) 1975	2919403	54502445	13124459	2478877	7665110	80690295
Growth Rate						
(f) '60 - '65	.13	.14	.02	.01	.01	.10
(g) '65 - '70	.15	.14	.06	.05	.04	.11
(h) '70 - '75	.13	.10	.07	.08	.07	.10
(i) '60 - '70	.30	.30	.08	.06	.05	.22
(j) '65 - '75	.29	.26	.13	.13	.11	.22
(k) GRR	.9923	.9692	1.0463	1.0660	1.0571	1.0000
Simple Average Growth Rate						
(l) '60 - '65	.11	.07	.02	.01	-0.00	.4
(m) '65 - '70	.06	.10	.05	.04	.02	.06
(n) '70 - '75	.08	.10	.07	.07	.05	.08
(o) '60 - '70	.23	.18	.07	.05	.02	.11
(p) '65 - '75	.20	.21	.12	.12	.08	.15
(q) GRR	.9806	1.0306	1.0432	1.0646	1.0552	1.0385
(r) SGRR	(.9756)	(1.0254)	(1.0467)	(1.0667)	(1.0588)	(1.0360)
S.Av Diversification Index						
(s) DI(11)	.84978	.86354	.84074	.82073	.78985	.83826
(t) DI(13)	.75128	.85961	.78274	.83252	.77175	.80510
(u) DIR	1.13663	1.00974	1.08384	.98639	1.03022	1.04966
(v) SDIR	(1.13111)	(1.00457)	(1.07410)	(0.98584)	(1.02345)	(1.04119)

For notations and remarks, see Table 5-g.

Table 5-b. Population for Non-J-SMSA Areas by Region

R. / C.	Non-J-SMSA Area				
	A	BC	D	E	Nation**
(a)	–	–	–	–	–
(b)	3049267	22063387	1948150	6100924	33161728
(c)	2915305	21804790	1782811	5485878	31988784
(d)	2590297	20993059	1602250	4926832	30112440
(e)	2418793	22514629	1561136	4752042	30204164
(f)	-.04	-.01	-.09	-.10	-.04
(g)	-.11	-.04	-.10	-.10	-.06
(h)	-.07	.07	-.03	-.04	+0.00
(i)	-.15	-.05	-.18	-.19	-.10
(j)	-.17	.03	-.12	-.13	-.06
(k)	.9765	1.084	1.0732	1.0741	1.0444

Table 5-c. Population for Whole Areas by Region

R. / C.	Whole Area				
	A	BC	D	E	Nation**
(a)	–	–	–	–	–
(b)	5039206	71354357	4121423	12903515	93418501
(c)	5171800	76757913	3975058	12370190	98274961
(d)	5184287	82559580	3904014	12072179	103720060
(e)	5338196	90141533	4040013	12417152	111936894
(f)	.03	.08	-.04	-.04	.05
(g)	+.00	.08	-.02	-.02	.06
(h)	.02	.09	.03	.03	.07
(i)	.03	.16	-.05	-.06	.11
(j)	.03	.17	.02	+.00	.13
(k)	1.0000	1.0086	1.0737	1.0638	1.0180

For notations and remarks, see Tables 5-a and 5-g.

Table 5-d Population and Diversification Index for J-SMSAs by Population Size (8 Classes)

C. \ Pop. Size	X1	X2	X3	X4	X5	X6	X7	X8
(a)	14	16	15	13	11	5	8	2
(b)	2377636	3914835	4877095	5230437	5948646	3780865	13469439	20657820
(c)	2389024	4012170	4963543	5357152	6155468	4099223	14569992	24739605
(d)	2401133	4201743	5187741	5824938	6542736	4492117	16537924	28419290
(e)	2491781	4454817	5533254	6337274	7151290	4933533	19047221	30741123
(f)	+.00	.02	.02	.02	.03	.08	.08	.20
(g)	.01	.05	.05	.09	.06	.10	.14	.15
(h)	.04	.06	.07	.09	.09	.10	.15	.08
(i)	.01	.07	.06	.11	.10	.19	.23	.38
(j)	.04	.11	.11	.18	.16	.20	.31	.24
(k)	1.0297	1.074	1.0472	1.0631	1.0545	1.0084	1.0650	.8986
(l)	.01	.03	.02	.03	.04	.09	.09	.21
(m)	.01	.05	.05	.09	.06	.09	.13	.15
(n)	.04	.06	.07	.09	.09	.10	.14	.08
(o)	.01	.09	.07	.13	.10	.19	.23	.39
(p)	.04	.12	.12	.19	.16	.20	.29	.24
(q)	1.0320	1.0295	1.0467	1.0591	1.0549	1.0083	1.0525	.8895
(r)	(1.0297)	(1.0275)	(1.0467)	(1.0531)	(1.0545)	(1.0084)	(1.0488)	(.8921)
(s)	.7895	.8311	.8394	.8472	.8579	.8863	.8588	.8595
(t)	.7620	.7675	.7976	.8130	.8337	.8851	.8476	.8853
(u)	1.0474	1.0987	1.0574	1.0469	1.0336	1.0019	1.0166	.9730
(v)	(1.0361)	(1.0829)	(1.0524)	(1.0421)	(1.0290)	1.0014)	(1.0132)	(.9709)

For notations and remarks, see Tables 5-a and 5-g.

Table 5-e
Population and Diversification Index for J-SMSAs by Population Size (3-Classes)

C. \ Pop. Size	Y1	Y2	Y3
(a)	58	16	10
(b)	16400003	9729511	34127259
(c)	16721889	10254691	39309597
(d)	17615555	11034853	44957214
(e)	18817126	12084823	49788345
(f)	.02	.05	.15
(g)	.05	.08	.14
(h)	.07	.10	.11
(i)	.07	.13	.32
(j)	.13	.18	.27
(k)	1.0561	1.0442	.9621
(l)	.02	.05	.11
(m)	.05	.07	.13
(n)	.06	.10	.13
(o)	.07	.13	.26
(p)	.11	.17	.28
(q)	1.0412	1.0403	1.0199
(r)	(1.0374)	(1.0354)	(1.0159)
(s)	.82682	.86679	.85897
(t)	.78415	.84974	.85518
(u)	1.0640	1.0237	1.0079
(v)	(1.0544)	(1.0201)	(1.0044)

Table 5-f
Number of J-SMSAs by Population Size and Region

Pop. Size \ Region	A	B	C	D	E	Total
X1	1	2	6	2	3	14
X2	3	3	6	0	4	16
X3	1	3	11	0	0	15
X4	0	4	5	3	1	13
X5	0	2	4	1	4	11
X6	0	5	0	0	0	5
X7	1	4	1	0	2	8
X8	0	2	0	0	0	2
Y1	5	12	28	5	8	58
Y2	0	7	4	1	4	16
Y3	1	6	1	0	2	10
Total for Each Category	6	25	33	6	14	84

For notations and remarks, see Tables 5-a and 5-g.

Table 5-g Notations and Remarks for Tables 5-a,b,c,d,e and f

A	=	Hokkaido Region
B	=	Honshu (I) Region(Tokaido-Sanyo-Megalopolis)
C	=	Honshu (II) Region (Non-Tokaido-Sanyo-Megalopolis)
D	=	Shikoku Region
E	=	Kyushu Region
BC	=	Honshu Region
X1	=	Population Size less than 200,000 as of 1970
X2	=	Population Size of 200,000 299,999 as of 1970
X3	=	Population Size of 300,000 399,999 as of 1970
X4	=	Population Size of 400,000 499,999 as of 1970
X5	=	Population Size of 500,000 749,999 as of 1970
X6	=	Population Size of 750,000 999,999 as of 1970
X7	=	Population Size of 1,000,000 4,999,999 as of 1970
X8	=	Population Size of 5,000,000 and over
Y1	=	Population Size less than 500,000
Y2	=	Population Size of 500,000 999,999
Y3	=	Population Size of 1,000,000 and over
GRR	=	(Population in 1970/Population in 1965)/(Population in 1970/Population in 1960) = (j+1)/(i+1)
SGRR	=	(S.Av Growth Rate for '65 - '75) + 1.0 / (S.av Growth Rate for '60 - '70 + 1.0) = (p+1)/(o+1)
DI(11)	=	Diversification Index of "Public Expenditure Pattern"
DI(13)	=	Diversification Index of "Industrial Employment Pattern"
DIR	=	DI(11)/DI(13)
SDIR	=	S.av DI(11)/S.av DI(13) = s/t

* S.Av, R. and C. stands for Simple Average, Region and Characteristics, respectively.
** Okinawa Prefecture is Excluded.

rather "smoothed" growth tendency was obtained. It should be noted in addition that we adopted the growth rate ratio (GRR) rather than the growth rate for the former period divided by that for the latter period in order to avoid the logical confusion frequently caused by the existence of negative growth rates.

With respect to the diversification index ratio (DIR), the Hokkaido region has the highest value (1.13111) while the Shikoku region has the lowest (0.98584). Further research would be required to explain these regional characteristics.

In Table 5-b, the growth rates of population for non-J-SMSA areas are presented. The three regions other than the Honshu region show negative growth rates in rows (i) and (j). Interestingly, all the regions except the Hokkaido region (which has experienced an increase in the rate of population loss) have high growth rate ratios; they are 1.084, 1.073 and 1.074 for the Honshu, Shikoku and Kyushu regions, respectively. The overall non-J-SMSA tendency is similar to that for these three regions. The rate of loss of population has significantly decreased in the non-metropolitan areas in the past five years.

Table 5-c summarizes the population growth pattern in each region in both metropolitan and non-metropolitan areas. One can see that the Shikoku and Kyushu regions, which used to be lagging in terms of population growth rate, have recently experienced positive growth rates even though these rates are still lower than the national average of 7 percent for the period from 1970 to 1975.

Overall, Tables 5-a, 5-b and 5-c indicate that the momentum of the trend of large shifts in population from non-metropolitan areas to metropolitan areas and from the Shikoku and Kyushu regions to the Honshu region has been gradually reduced in the period studied.

Tables 5-d and 5-e show population-growth characteristics by population-size class and Table 5-f shows the number of J-SMSAs in the population size-region matrix. The data in Table 5-d show that J-SMSAs with the highest growth-rate ratios

are found in the 400,000 - 499,999 (X4) and 1,000,000 - 4,999,999 (X7) population-size classes.

The data in Table 5-e indicate that, as a rough tendency, the larger the J-SMSA, the lower will be the population growth-rate ratio. Similarly, the larger the J-SMSA, the lower will be the diversification index ratio. Further research is required to gain a better understanding of the reasons for these phenomena, and thus a better understanding of the dynamics of the spatial population structure in Japan.

Table 6 gives the correlation coefficient matrix for the main variables discussed in this paper. Interestingly, the Shikoku region has a number of relatively high correction coefficients. Also, there are high correlation coefficients between the growth-rate from 1970 to 1975 and the employment share of wholesale and retail trade, and between this growth rate and the employment share of the services sector.

VI. Concluding Remarks

In this paper an attempt has been made to draw a profile of Japanese population growth on the basis of data collected for the J-SMSAs. Research of this kind is difficult in Japan because of the need to collect and tabulate data by hand. Clearly, further research is needed in order to make a reasonable plan for utilizing the nation's limited land more efficiently. There is an urgent need to have data for J-SMSA-type statistical units collected and published by the government. This will encourage more scholars to undertake studies of human settlement and related problems, as well as of fundamental agglomeration processes that influence the evolution of urban systems.

Table 6 Correlation Coefficients for J-SMSAs

C. \ R. & Pop. Size	A	B	C	D	E	X1	X2	X3	X4	X5	X6	X7	X8
Pop70 v. GR70-75	.87	.48	.41	.47	.60	.46	.23	.07	-.33	-.40	.65	.42	(1.0)
Pop70 v. GRR	.23	-.35	.19	.51	.08	-.25	-.05	.18	-.14	-.06	-.05	.08	(1.0)
Pop70 v. DIR	-.28	-.25	-.23	.75	.09	-.18	-.39	.00	-.06	.41	-.50	-.23	(-1.0)
GRR v. DIR	-.25	.07	.07	.52	.10	.08	-.21	-.22	.37	.30	-.24	-.23	(-1.0)
Pop70 v. DI(11)	-.38	.14	.31	.69	.73	.42	-.35	.16	.35	.30	.16	.20	(-1.0)
Pop70 v. DI(11.2)	-.02	.41	-.03	-.78	-.30	-.26	.08	.06	.14	.28	.05	.02	(1.0)
Pop70 v. DI(11.3)	-.28	.03	-.16	-.09	-.05	-.33	.22	-.12	-.26	-.05	.49	-.30	(1.0)
Pop70 v. DI(11.8)	.82	.40	.28	.55	.70	.20	-.34	.03	.45	-.09	-.63	.19	(-1.0)
Pop70 v. DI(11.10)	-.58	.38	-.11	.29	-.13	.13	.09	.08	-.33	-.01	.15	.41	(1.0)
GR70-75 v. DI(11)	-.27	.26	.16	.22	.83	.42	.55	-.08	.28	.16	.26	.50	(-1.0)
GR70-75 v. DI(11.2)	.04	-.05	-.14	-.14	-.38	-.40	-.14	.22	.04	-.34	-.19	.44	(1.0)
GR70-75 v. DI(11.3)	-.37	-.20	-.02	.39	-.50	-.33	-.38	-.36	-.19	.03	.42	-.65	(1.0)
GR70-75 v. DI(11.8)	.73	.20	.30	.07	.60	.57	.28	.34	.18	.03	-.23	.17	(-1.0)
GR70-75 v. DI(11.10)	-.39	.37	.24	-.20	.26	.08	.73	.19	.57	.26	-.18	.41	(1.0)
Pop70 v. DI(13)	.15	.33	.45	-.14	.51	.40	.20	.15	.25	-.29	.50	.46	(1.0)
Pop70 v. DI(13.1)	-.39	-.67	-.17	.65	-.60	-.39	-.06	.14	.25	.64	-.58	-.46	(1.0)
Pop70 v. DI(13.6)	-.08	.34	-.01	-.79	.05	.27	.08	.13	.16	-.22	-.58	.87	(-1.0)
Pop70 v. DI(13.7)	.78	.59	.38	.72	.58	-.29	-.00	-.05	-.15	.02	.79	-.66	(-1.0)
Pop70 v. DI(13,12)	.79	-.02	-.01	.59	.53	-.14	.08	-.30	-.31	-.16	.73	-.73	(1.0)
GR70-75 v. DI(13)	-.24	.09	.29	-.78	.25	.07	.29	.12	-.03	-.03	.33	-.51	(1.0)
GR70-75 v. DI(13.1)	-.17	-.13	-.34	.52	-.34	-.39	-.19	.20	-.68	-.10	-.82	-.05	(1.0)
GR70-75 v. DI(13.6)	-.48	.43	-.14	-.75	-.26	.15	.19	-.03	.64	-.09	-.68	.01	(-1.0)
GR70-75 v. DI(13.7)	.90	-.09	.53	.76	.65	.07	.08	-.10	-.50	.06	.73	.16	(-1.0)
GR70-75 v. DI(13,12)	.59	-.23	.51	.66	.73	.09	.26	-.14	-.39	.26	.90	-.06	(1.0)

Table 6 (continued)

C. \ R. & Pop. Size	Y1	Y2	Y3	All J-SMSAs
Pop70 v. GR70-75	.40	.01	-.19	.17
Pop70 v. GRR	.19	-.53	-.52	-.19
Pop70 v. DIR	-.08	-.08	-.36	-.21
GRR v. DIR	.08	.34	-.06	-.01
Pop70 v. DI(11)	.36	.43	.06	.34
Pop70 v. DI(11.2)	-.06	.24	.31	-.23
Pop70 v. DI(11.3)	-.10	-.61	-.01	-.16
Pop70 v. DI(11.8)	.26	.20	-.26	.50
Pop70 v. DI(11.10)	.15	.24	.78	.19
GR70-75 v. DI(11)	.37	.20	.38	.42
GR70-75 v. DI(11.2)	-.02	-.28	.29	-.14
GR70-75 v. DI(11.3)	-.28	.09	-.51	-.29
GR70-75 v. DI(11.8)	.35	-.02	.17	.43
GR70-75 v. DI(11.10)	.48	.15	-.02	.31
Pop70 v. DI(13)	.32	.32	.52	.26
Pop70 v. DI(13.1)	-.05	-.32	-.45	-.34
Pop70 v. DI(13.6)	.20	.50	.67	.22
Pop70 v. DI(13.7)	-.09	-.15	-.30	.25
Pop70 v. DI(13,12)	-.16	-.46	-.54	+.00
GR70-75 v. DI(13)	.23	.04	-.49	.29
GR70-75 v. DI(13.1)	-.19	-.30	.11	-.36
GR70-75 v. DI(13.6)	.27	-.17	-.18	.22
GR70-75 v. DI(13.7)	-.10	.35	.13	.22
GR70-75 v. DI(13,12)	-.00	.35	.14	.12

Notations;

Pop 70 = Population in 1970

GR 70-75 = 5-year Population Growth Rate from 1970 10 1975

DI(11, i) = Budget-expense in Item i

DI(13, i) = Employment in Industry i.

For other notations, see Table 5-g.

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